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STUDY PROJECT

TOTAL CONTRACTS FOR MAJOR SYSTEMS

BY

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With the dearth of funds projected for military procurement over the next five to ten years and the annual battle between the legislative and executive branches of government over the defense budget; the Army must find a way of getting the most for its scarce dollars. By contracting for the total requirements on selected major systems we can reduce the costs of these systems and take them out of the political arena. In addition, we can use

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ABSTRACT (continued)

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TOTAL CONTRACTS FOR MAJOR SYSTEMS

AN INDIVIDUAL STUDY PROJECT

BY

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With the dearth of funds projected for military procurement over the next five to ten years and the annual battle between the legislative and executive branches of government over the defense budget; the Army must find a way of getting the most for its scarce dollars. By contracting for the total requirements on selected major systems we can reduce the costs of these system and take them out of the political arena. In addition, we can use better methods to select and justify these systems. This study seeks to look into these areas and provide methodology which will stimulate the reader to select new and better ways to use the acquisition process.

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TOTAL CONTRACTS FOR MAJOR SYSTEMS

CHAPTER I

INTRODUCTION

A considerable amount of time and thought has been given by Congress and the military on reducing the amount of time and money required to completely field new systems in the Army. However, most of this work has been accomplished on the concepts and development phase of the material acquisition process. (See Appendix 1.) Very little has been done in reducing the time and costs at the full scale development or to the production phases. This study will attempt to develop ideas which will both speed up the total process while reducing the amount of money required to totally field major items developed.

BACKGROUND

Much has been accomplished to speed up the material acquisition process during the last ten years. The reasons are obvious. The CINCS need to receive their new equipment in order to train their units for contingencies plans. Congress wishes to reduce costs and provide easier

rules and regulations (they actually make more rules) for their constituents and lastly, the Army wishes to compress the whole process, and to get the most "bang for the buck".

Appendix 2 shows the new and accelerated acquisition process adopted by the Army. When compared it with the old system in appendix 1, we see that we have saved years of processing time.

The use of non-developmental or off the shelf procurement of a total system or components has proven that it greatly reduces the cost and production time; as well as, reducing the spare parts costs over the life of the system. In recent years, we have adopted multi-year contracting as an additional means of reducing costs while in some cases speeding up the total process time.

Multi-year contracts are recognized as a solution to the budget problems of annual buying and in November of 1962 the Office of the Secretary of Defense adopted multi-year procurement as their preferred method for contracting.1 Both contractors and the armed services liked multi-year procurement because it reduces cost, time and uncertainty in contacting for major systems.2 Multi-year contracts reduce costs by allowing the manufacturer to buy the materials in the most economical quantities. He can also develop an improved and productive assembly line to build systems at the most economical level of production. When the Army has 29 congressional committees and 55 subcommittees overseeing defense activities, annual contracting can become very uncertain.

CHAPTER II

DEVELOPMENT-PRODUCTION PROVE OUT PHASE

INTRODUCTION

The bulk of the money spent on the acquisition of the new system will be established before and during the development and production prove out phases. However, the decisions made during this critical phase will greatly influence the manufacturing costs during the production phase. The purpose of the full scale development and production prove out phase is to design, fabricate, test and evaluate the complete system.

TESTING

The most visible part of this phase is the prototype operational testing, where the new system is tested against the army requirements it was designed against. Testing is extremely important to insure that the system can preform to established standards. These standards include operational characteristics [speed, distance and effectiveness], reliability, mean time between failures, and ease of maintenance. Testing is also critically important in evaluating the manufactures method of producing the new system.

The goal is to provide the best system at the least cost to the army. The ways and means the manufacture uses to produce the new system will greatly influence the production cost and the rest of the life cycle costs. Therefore, this testing and evaluation of the manufacturing line is very important to the "least cost" side of the equation. This will be especially true if there is competition between two or more manufactures at this phase.

REQUIREMENTS

A high priority during this phase is to ensure that necessary quantities of equipment can be afforded. Two major documents are refined during this phase that have a large impact on the production phase that follows. These are the Basis of Issue Plan (BOIP) and the Material Fielding Plan. It is very important that these plans are carefully produced to preclude changes in the production and fielding phases that will cause changes in priorities and distribution. The current system plans that all units will receive the new system during it's life cycle and this is outdated and unrealistic. The number of units, and therefore the number of systems, must be achievable during this era of tight defense budgets. This will be discussed in the next chapter. Trade-offs as to performance and cost will be accomplished to give the optimum system effectiveness with the lowest possible cost.

CHAPTER III

TOTAL REQUIREMENTS PROCUREMENT

"This acquisition process is also one in which the long-term goals of strategy and sound management may be put at risk during the congressional budget process because a short-term planning horizon is imposed by the annual budget debate and the domestic priorities of constituent representatives."3 What this means is that the services may plan for the most economical and efficient meads for producing a system only to have the funding cut or delayed by Congress. This lack of funds results in inefficient quantities of the system being produced at a higher unit cost. This quote sums up the case for moving from annual to multi-year procurement of major weapons systems. However, we must be aware that multi-year contracts do not guarantee that funding will be appropriated for all of the years contracted. The Army's contract usually will have escape clauses, that provide per contract large penalty payments, which could allow for the contract to be cancelled.

We could alleviate this problem by moving on to the next logical step to contract for the <u>total</u> requirements for the Army over the life of the system.

WHAT SYSTEMS?

In a perfect world the Army would fund all of its major weapons systems for the life cycle of each system; however, this would not be practical for a number of reasons.

First the requirements (numbers) of a system would change over time due to changes in doctrine. For example, a change from eight guns per artillery battery to only six guns per battery. A reduction or increase in the total number of artillery battalions would change the force structure. Technology advances produce new types of gun and new types of ammunition. In buying total systems, we have to be very careful in selecting systems that have a rather long life cycle, trucks would be an example.

Second we would have to selective, since the Army would need the flexibility to procure new systems as new technology emerged and new threats developed. In other words, we could not tie up all of our procurement dollars for the next five to seven years only to find out that new technology has made our current weapons system obsolete.

WHO WOULD BE FIELDED

The hard decisions as to what elements of the Army would be fielded with specific weapon systems would have to be answered. Do we field all active army units? Which national guard and army reserve units would 6

require the new weapons systems to meet the threat based on a stable national (military) strategy? We would have to stabilize the missions and the unit priorities for long periods if the system is going to work. We have to determine what is affordable over the life cycle of the system and develop realistic fielding plans.

COORDINATION WITH CONGRESS

The Army could sell this system to Congress based on program instability caused by the complex legislative/executive budget system. Program vacillation results in increased costs and additional time to fielding.4 The Department of Defense should submit budgets substantially in line with what Congress intents to provide, but all the services must adhere to this strategy.5 The Army must coordinate with Congress to guarantee out year funding for total requirement procurement to eliminate the annual hassle between Congress and the Executive Office (DOD) over a large part of the military procurement budget. If sixty per cent of the army procurement budget was "frozen" by Congress and DOD, to meet the budget requirements of the most important and systems, it would allow the Army to reap the benefits of total army procurement while allowing Congress and the Executive branch to argue annually over the lesser weapon systems. This would lock in selected weapons systems, which in turn would lock in

our doctrine and possibly strategy. This would have both good and bad effects and the good effects were discussed above. The bad effects could have major impacts on the services since new technology breakthroughs and new doctrine developed by the Soviets could not be countered by the United States without paying a high cost for cancelling existing weapon systems. This would be necessary to develop new systems and doctrine to meet the new threat. The stability provided to the CINCS in doctrine and unit fielding which are the good effects should outweigh the bad effects of locking in our long range doctrine and strategy.

CHAPTER IV

TRADE-OFF ANALYSIS

We must have an analytical system or method to determine which systems should be funded for the total life cycle fielding. I will use an anti-tank round as an example to show how this can be accomplished.

This fictitious round will have the following characteristics:

	PREFERRED ROUND	SECONDARY ROUND
Cost	$35,000	$7,000
Weight	65 lbs.	50 lbs
Probability of Kill	90 %	30 %
Storage (sqft)	4	4

Common sense shows that in attempting to maximize our financial expenditures for procuring anti-tank ammo, that the preferred round is three times more effective as the secondary rounds in killing the enemy tank. Now adding put in the cost factor we find that the preferred round costs five times as much as the secondary round. We can buy five secondary round for the cost of one preferred round.

The most "BANG FOR THE BUCK" equals the lesser of [preferred round cost ($35,000) multiplier by the preferred round kill per cent (90%) divided by the preferred round kill per cent (90%)] or [the secondary cost ($7,000) multiplied by the preferred round kill per cent (90%) divided by secondary round kill per cent (30%)] OR

B for B =s the lesser of $35,000 * 1 or $7,000 * 3 OR

B for B =s the lesser of $35,000 or $21,000 OR

B for B is the secondary round

Using the above data we would select the secondary round because we could buy five secondary rounds giving a tank kill ratio of 1.5 for $35,000 as apposed to the one preferred round for the same cost and a tank kill ratio of 0.9.

The problem with the above analysis is that it does not take into account many second and third order effects that have an overall financial effect on the total monies spent by the Army. If we add in some additional factors and use incremental reasoning, the results of our financial decision may change drastically.

If for example, the enemy was using an anti-tank round with a first round kill probability of 50%, we would need to factor in the additional cost of losing more of our tanks because we were using rounds with only a probability of 30% kill instead of the 90% probability of the more costly preferred round. If we use a cost of one million dollars for our tank, the additional cost would look something like this:

Preferred round cost multiplied by kill factor of 1 plus tank replacement cost divided by [enemy kill per cent divided by preferred kill per cent] OR $35,000 * 1 + [$3,600,000 (0.50 / 0.90)] OR $2,035,000

Secondary round cost multiplied by a kill factor of 5 plus tank replacement cost divided by [enemy kill per cent divided by preferred kill per cent] OR $7,000 * 5 + $3,600,000 / (0.50 /0.30) OR $2,117,666

While this simple formula could be greatly improved using statical methods to better measure the risk, the differences would only be increased.

The additional costs of losing the tanks would be extremely important since we now have only secondary rounds to fire and we would need as many firing platforms as possible to fire the additional rounds necessary to kill the enemy tanks. This measure can not be a totally financial decision since this scenario would result in a defeat in battle.

We have now looked at the basic financial factors and one secondary factor that should be considered in determining the trade off between preferred and secondary ammunition. We now look at third order logistical factors: transportation, storage, and distribution.

First are the costs to the transportation system amounting to $250. We can compute how much extra it will cost to transport three secondary rounds (50 lbs each) as opposed to one preferred round (65 lbs each).

Preferred round transportation cost equals the cost per ST multiplied by (preferred weight divided by 2000 lbs.) OR $8.13.

Secondary round transportation costs equals the costs per ST multiplied by [secondary weight times 3 divided by 2,000 lbs] OR $250 * (50 * 3 / 2000) OR $18.75.

This same reasoning applies to the storage costs. If we use the same square footage for both the preferred or the secondary rounds and the storage cost is $5.00 per round per year we can add this to the equation based on a five year storage time. This would equate to two more rounds to be stored at a cost of $10.00 for using secondary ammo.

Preferred round storage cost equals one round multiplied by cost per year multiplied by the number of years OR 1 * $5 * 5 OR $25

Secondary rounds storage costs equals three rounds multiplied by the cost per year multiplied by the number of years OR $75

The last logistical factor is the distribution costs. It will take three times the effort to distribute the additional rounds required if we are using secondary ammunition. If the distribution costs for each round is $1.00, the additional costs for not using preferred rounds would be $2.00. The cost difference shown is very small but the dearth of trucks in the army CSS units could result in an increase in the total number of trucks required.

We have used a fictitious round of ammunition for the tank and through a series of methods we have incrementally looked at developing formulas to

help the Army decide the best long range buy. However, the procurement of ammunition is just one means of using this system. This reasoning could be applied to all sorts of trade-offs in the army; such as, should we buy trucks or tanks; or even, should we buy tanks or more preferred ammunition for the tanks?

These factors looked only at the material and service costs involved; however, if the people costs were considered there would be even greater differences.

CHAPTER V

SECOND ORDER EFFECTS

INTRODUCTION

So far we have focused on selecting certain major systems for total requirements contracting. The results have primarily effected the production and deployment phases; however, there will be some second order effects on the early phases of the acquisition process as well.

SPARE PARTS

The first item effected is the procurement of spare parts for the major systems selected for total requirements contracting. When a new item is fielded, spare parts are required over time to keep the item operational. It is very difficult to procure the proper quantities of spare parts for the system without a firm production schedule. This makes spare parts procurement difficult to gage and increases costs for spares. On the other hand a total system acquisition would accurately project the total amount of spare parts required over the life cycle of the system by using the historical data available for like type systems and adjusting

it for the new technology available. This would result a cost savings and improved unit readiness.

TECHNICAL DATA PACKAGE

A second area that would be effected would be the technical data package which is a part of the acquisition development costs. The Army requires the technical data from the manufacturer to enable it to second source a system or reproduce the system at a later date. As discussed in chapter 1, annual budget changes are frequent and result in quantities changing from year to year. Therefore, the technical data package can be used contract for additional systems when funding is available. The technical data insures that new production of a system will be of "like" design and use the same spare parts. This package is quite costly and time consuming for the manufacturer to produce. Total system contracts would not need the technical data and would result in substantial saving of time and money. History has shown the initial contractor system has an advantage over his competitors and he always wins the new contract. Buying all we need on the initial contract would preclude the need for a TDP and renegotiated follow on contracts.

CONTRACT PROVISIONS

The third and last area is the contract provisions. Multi-year contracts for a system can lose a lot of the benefits achieved because of the required escape clauses. The escape clauses are required because, while Congress has approved the multi-year contract, it may not appropriate the money to complete the out-years of the contract. This is an substantial amount which essentially insures the manufacturer that he will not lose money if the contract is cancelled because Congress did not appropriate the funds. This makes sense, since most of the time the manufacturer is losing money on the early production runs due to his high start-up costs. A total system contract with appropriations from Congress eliminates the escape clause from the contract with a large saving of both time and money. Congress has shown a willingness to allow multi-year contracts because of the cost saving. Total system contracts are really just longer term multi-year contracts for the life of the system.

CHAPTER VI

SUMMARY

This paper has examined total system acquisition from a viewpoint of reducing the time and money required to fully deploy the major systems required by the Army. In addition, it examined ways of determining how systems should be selected and to justify their selection. The benefits of using these types of contracts throughout the acquisition process could greatly benefit the Army.

Mr. George C. Wilson, a staff writer for the Washington Post, states the Defense Secretary Frank C. Carlucci will recommend to Congress that they commit themselves to buying major weapon programs such as the B2 stealth bomber, C17 transport plane, Bradley fighting vehicle, Apache helicopter and Navy destroyers with long range contracts (multi-year).6 This type of procurement will be with the Army in the future whether or not we like it.

To make the best use of total system contracts (really multi-year contracts or long range contracts) the army must develop a system that will upfront establish and justify the numbers required while taking into account the reality of budget constraints.

ENDNOTES

1. Logistics Management Institute, Implementation Status -- Multi-year Procurement, p. 2.

2. Ibid., p. 4.

3. CSIS, U.S. Defense Acquisition : A Process in Trouble, p. 12.

4. Ibid., p. 32.

5. Ibid.

6. George Wilson, "Final Carlucci Budget to Urge Multiyear Weapons Contracts," Washington Post, 12 December 1988, p. A1.

BIBLIOGRAPHY

CSIC. U.S. Defense Acquisition : A Process in Trouble, Washington: 1987.

Department of Defense. DOD Directive Number 4155.1 "Quality Assurance", Washington D.C.: 10 August 1978.

HQ, US Army Materiel Command and HQ US Army Training & Doctrine Command. Materiel Acquisition Handbook, Alexandria,Va.: 26 March 1987.

Logistics Management Institute. Implementation Status -- Multi-year Procurement, Washington: 1965.

Logistics Management Institute. Multi-year Procurement at the Subcontractor Level, Washington: 1967.

National Security Industrial Association. Defense Acquisition Study, Washington: 1970.

Rand. Improving the Military Acquisition Process, Santa Monica, Ca.: 1986.

United States Army Logistics Management Center. Reference Book for Data Acquisition, Ft. Lee,Va.: 1986.

United States Army Logistics Management Center. Reference Book for Financial/Cost Management and Techniques, Ft. Lee,Va.: 1987.

United States Army Logistics Management Center. Reference Book for Force Modernization, Ft. Lee,Va.: 1987.

United States Army Logistics Management Center. Reference Book for Fraud, Waste, and Abuse, Ft. Lee,Va.: 1985.

United States Army Logistics Management Center. Reference Book for Production Management, Ft. Lee,Va.: 1987.

United States Army Logistics Management Center. Reference Book for Value Engineering, Ft. Lee, Va.: 1987.

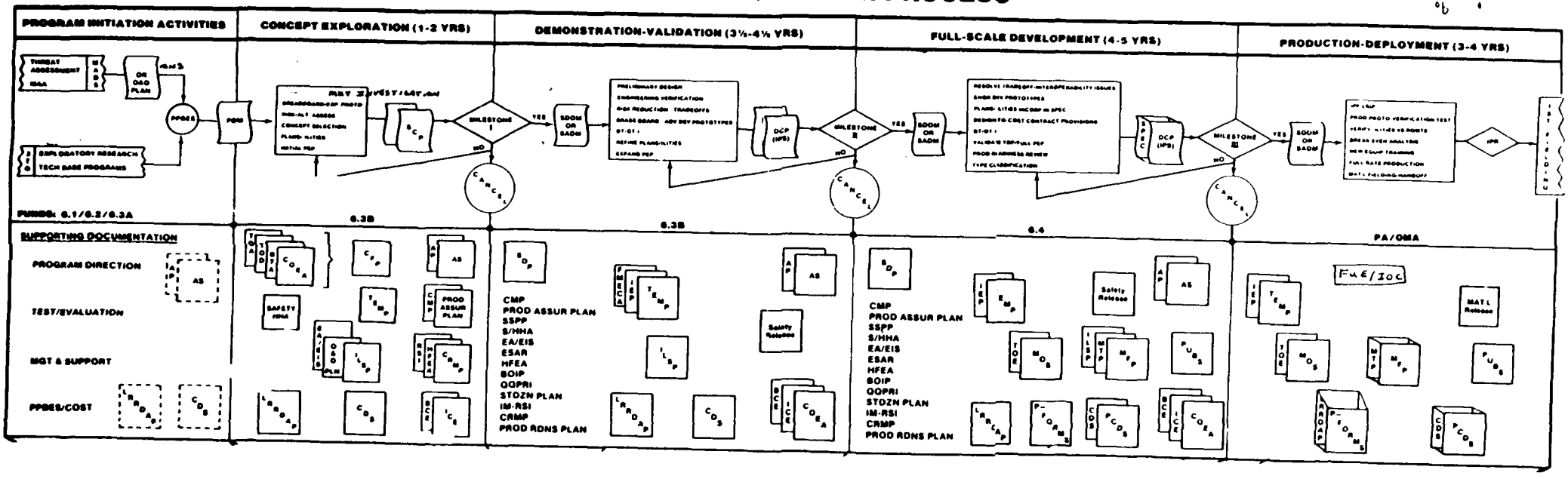
United States Army War College. Army Command and Management: Theory and Practice, Carlisle Barracks, Pa : 1988-1989, chapter 17.

Wilson, George. "Final Carlucci Budget to Urge Multi-year Weapons Contracts" Washington Post, 12 December 1988, p. A1.

APPENDIX 1

OLD ACQUISITION PROCESS

CURRENT ACQUISITION PROCESS



APPENDIX 2

STREAMLINED ACQUISITION PROCESS

STREAMLINED "FOUR YEAR DEVELOPMENT" ACQUISITION PROCESS